CLAIMS

1. A substantially temperature-insensitive photodetector circuit (100) characterised in that it incorporates photon detecting means (200) arranged to produce an electric current (I_{bl}) in response to incident photon illumination associated with a current load device (114) arranged to produce a voltage (V'_{gs}, V'_{ph}) response to current flow wherein
   (a) the photon detecting means (200) is arranged to provide an output current (I_{bl}) which is supplied to the current load device (114),
   (b) the current load device (114) has a current-voltage characteristic in which the voltage is a logarithmic function of current flow, and
   (c) the photon detecting means (200) is a phototransistor with a current gain factor (β) greater than unity.

2. A photodetector circuit (100) incorporating photon detecting means (200) arranged to produce an electric current (I_{bl}) in response to incident photon illumination associated with a current load device (114) arranged to produce a voltage (V'_{gs}, V'_{ph}) response to current flow wherein
   (a) the photon detecting means (200) is arranged to provide an output current (I_{bl}) which is supplied to the current load device (114),
   (b) the current load device (114) has a current-voltage characteristic in which the voltage is a logarithmic function of current flow,
   (c) the photon detecting means (200) is a phototransistor with a current gain factor (β) greater than unity, and
   (d) the circuit (100) is substantially insensitive to temperature over a range of light intensity and temperature normally to be encountered in a daytime natural environment.

3. A photodetector circuit according to Claim 1 ~~or 2~~ characterised in that the phototransistor (200) and current load device (114) are arranged to provide an output signal (V'_{ph}) including a contribution from leakage current ($I'_{leakage}$) and a contribution ($\beta I'_{ph}$) responsive to incident illumination and the latter contribution ($\beta I'_{ph}$) exceeds the former ($I'_{leakage}$) at all normal operating temperatures of the circuit such that the circuit is substantially temperature insensitive.

4. A photodetector circuit (100) according to Claim 1, ~~2 or 3~~ characterised in that the phototransistor (200) and current load device (114) are fabricated using BiCMOS technology.

5. A photodetector circuit (100) according to Claim 1, ~~2, 3 or 4~~ characterised in that the current load device (114) is a MOSFET device with its source (116) or drain connected to the phototransistor (200) and the phototransistor (200) is arranged to produce an electric current (I_{bi}) which is low enough to operate the MOSFET (114) in its subthreshold regime.

6. A photodetector circuit (100) according to Claim 5 characterised in that the phototransistor (200) is a bipolar transistor incorporating a photodetecting base region and with emitter connected to the load MOSFET (114).

7. A substantially temperature-insensitive photodetector circuit (100) characterised in that it includes a bipolar phototransistor (200), a load MOSFET (114) and voltage detecting means (122, 130, 134) wherein:
   (a) the bipolar phototransistor (200) is arranged to supply photocurrent output (I_{bi}) to the load MOSFET (114),
   (b) the phototransistor (200) is arranged such that photocurrent output (I_{bi}) is sufficiently small to maintain subthreshold operation of the load MOSFET (114), and
   (c) voltage detecting means (122, 130, 134) is arranged to detect a voltage output from the load MOSFET (114) in response to photocurrent supply.

8. A photodetector circuit (100) according to Claim 6 ~~or 7~~ characterised in that the phototransistor (200) and MOSFET load (114) are fabricated using BiCMOS technology.

9. A photodetector circuit (100) according to ~~any preceding~~ claim characterised in that the photodetector (100) is for the purpose of operation in environmental temperatures ranging from -20 to 60°C with substantially unaffected sensitivity at illumination levels down to 1 lux.

10. A photodetector circuit (100) according to ~~any preceding~~ claim 1 characterised in that the circuit (100) incorporates an attenuator arranged to reduce the intensity of light (120) prior to incidence on the photon detecting means (200) to an extent necessary to provide for the resultant output current (I_{bl}) to be low enough to operate the MOSFET (114) in its subthreshold regime.

11. A photodetector circuit (100) according to Claim 10 characterised in the photodetector (100) is capable of operation in environmental temperatures ranging from -20 to 60°C with substantially constant contrast sensitivity.

12. A photodetector circuit (100) according to Claim 6 characterised in that the load MOSFET (114) and phototransistor (200) are connected at a common connection point (118) to buffering means (122) and the buffering means (122) is connected to a pixel readout circuit.

13. A photodetector circuit (100) according to ~~any preceding~~ claim 1 characterised in that it is incorporated in an array of like circuits (100).

14. A detector array characterised in that it is an array of photodetector circuits each in accordance with ~~any one of Claims 1 to 12~~ claim 1.

15. A digital camera characterised in that it incorporates an array of photodetector circuits each in accordance with ~~any one of Claims 1 to 12~~ claim 1.

16. A digital camera incorporating an array of photodetector circuits characterised in that each circuit (100) incorporates photon detecting means (200) arranged to produce an electric current (I_{bl}) in response to incident photon illumination associated with a current load device (114) arranged to produce a voltage (V'_{gs}, V'_{ph}) response to current flow, and wherein

(a) each circuit (100) is of BiCMOS construction,

(b) the photon detecting means (200) is arranged to provide an output current (I_{bl}) which is supplied to the current load device (114),

(c) the current load device (114) has a current-voltage characteristic in which the voltage is a logarithmic function of current flow,

(d) the photon detecting means (200) is a phototransistor with a current gain factor (β) greater than unity, and

(e) the phototransistor (200) and current load device (114) are arranged to provide an output signal (V'_{ph}) including a contribution from leakage current ($I'_{leakage}$) and a contribution ($\beta I'_{ph}$) responsive to incident illumination and the latter contribution ($\beta I'_{ph}$) exceeds the former at all normal operating temperatures of the circuit such that the circuit is substantially temperature-insensitive.

17. An apparatus comprising hand-held computer technology characterised in that it incorporates an array of photodetector circuits each in accordance with ~~any one of Claims 1 to 12~~ claim 1.

18. A personal digital assistant characterised in that it incorporates an array of photodetector circuits each in accordance with ~~any one of Claims 1 to 12~~ claim 1.

19. A car characterised in that it incorporates a digital camera according to Claim 15 ~~or 16~~ and signal processing means wherein the signal processing means is arranged to analyse data received from the digital camera and assist in car control.

20. A substantially temperature-insensitive method of measuring photon radiation intensity over a dynamic range greater than four orders of magnitude characterised in that the method comprises the steps of:

(a) providing a photodetector circuit (100) comprising a bipolar phototransistor (200) arranged to supply output current (I_{bl}) to a load MOSFET (114),

(b) arranging the phototransistor (200) to respond to incident radiation (120) by providing output current (I_{bl}) to operate the load MOSFET (114) subthreshold,

(c) detecting the load MOSFET output voltage (V_{ph}) response to said output current (I_{bl}).

21. A method of measuring photon radiation intensity according to Claim 20 characterised in that the photodetector circuit (100) of Step (a) is fabricated in BiCMOS.